

**NEW SPECIES OF *DIOXYPTERUS* FAIRMAIRE FROM
TONGA AND FIJI, WITH NEW DISTRIBUTION
RECORDS, A TRIBAL REASSIGNMENT, AND
KEY TO THE SPECIES OF THE REGION
(COLEOPTERA: ELATERIDAE)**

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Abstract.—*Dioxypterus tonga* NEW SPECIES and *D. eua* NEW SPECIES are described from Tonga and are the first species of *Dioxypterus* reported from east of Fiji. *Dioxypterus beaveri* NEW SPECIES is described and *D. ovalauensis* Van Zwaluwenburg newly recorded from Viti Levu, Fiji. *Dioxypterus* is removed from the Hemirhipini (Agrypninae) and reassigned to the Dicrepidiini (Elaterinae). A key to the species of Fiji and Tonga is provided.

Key Words.—Insecta, Elateridae, *Dioxypterus*, taxonomy, Tonga, Fiji.

Dioxypterus Fairmaire is a moderately diverse genus of 31 species, including those herein described. Species of this genus are restricted to the south-central Pacific, from northeastern Papua New Guinea, through the Bismarck and Solomon archipelagos, south to Tanna I., Vanuatu, and east to Fiji. Here, two species are reported from Tonga for the first time, both previously undescribed. In addition, a new species is also described from Viti Levu, Fiji, and *D. ovalauensis* Van Zwaluwenburg is newly reported from Viti Levu.

Adult *Dioxypterus* are readily recognized by their fusiform body that usually appears humped in profile at the elytral base, attenuate and acuminate elytra, antennae short and serrate reaching only to pronotal posterior margin, a frontal margin that is often incompletely carinate medially, closed pronotosternal sutures, and a prosternal process that is greatly expanded and bidentate posteriorly. This form of prosternal process is known only from the species of *Dioxypterus*, the Melanesian *Symphostethus* Schwarz, and the neotropical *Ypsilosthetus semiotulus* Candèze. Among the South Pacific elaterids, *Dioxypterus* species are distinctive and are not usually confused with other click beetles.

The genus was diagnosed by Fairmaire (1881) with four Fijian species originally attributed. Hyslop (1921) designated *D. nigrotransversus* Fairmaire as type species. Neither Schwarz (1902) nor Van Zwaluwenburg (1933, 1940) provided revised generic diagnoses of the genus while describing many of the valid species. Because of this lack of discreet characterization a redescription including the salient traits of generic value is presented below.

In the following descriptions, mensural traits given are length and width. Body length is measured from the frontal margin to elytral apex, and width measured at the elytral humeri. Antennal and tarsal segment length ratios are measured along the dorsum of each segment. The ocular index is also used (Campbell & Marshall 1964). Terminology for genital structures follows Lawrence & Britton (1991), and wing venation terminology follows Kukalová-Peck & Lawrence (1993). Geographic names follow Motteler (1986).

Depositories—Holotypes are deposited at the Bernice P. Bishop Museum, Honolulu (BPBM). Additional specimens are deposited at BPBM or in the author's personal collection (PJJC).

DIOXYPTERUS FAIRMAIRE

Fairmaire's (1881) original description lacked nearly all characteristics of value for modern interpretation of click beetle relationships. Since no subsequent author has provided a revised generic characterization one is presented here to facilitate future studies.

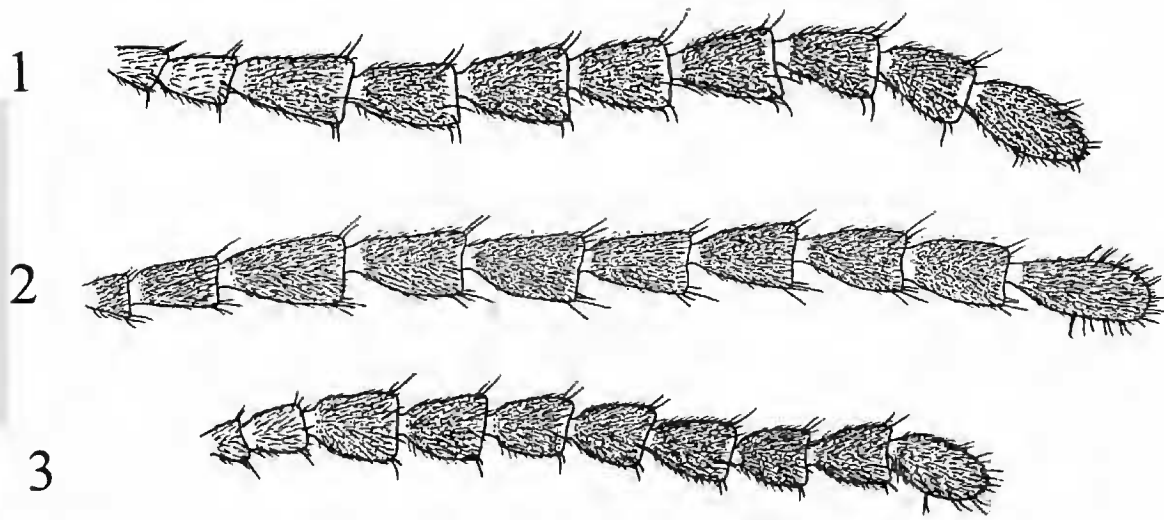
Redescription.—Body fusiform; dorsum shallowly convex, venter strongly convex. Head convex on frons; supra-antennal ridges obtuse to subcarinate, anteromedially directed, conjoined medially to form a complete and usually subcarinate fronto-clypeal margin; antenna 11-segmented, serrate from segment 4; mandible strongly arcuate ectally; maxillary and labial palps with ultimate segment elongate, narrowly subsecuriform. Prothorax with pronotum trapezoidal, basal incisures absent, hind angles bicarinate dorsally; pronotosternal sutures closed anteriorly, mesal margin of hypomeron with a narrow polished and flattened bead; prosternal intercoxal process broadly, dorsoventrally arcuate posteriorly. Mesosternum with sides of median fossa subvertically declivous; mesepimeron and mesepisternum reaching coxal cavity. Meso-metasternal suture connate, with or without surface trace. Elytra attenuate, apices mucronate as an extension of stria interval 3, intervals flat to shallowly convex, striae shallowly impressed and with small punctures. Metathoracic wings with RP_1 , RP_2 and RP_3 apical sclerotizations, CuA_2 - CuA_{3+4} crossvein present, CuA_1 - MP_{3+4} juncture proximal of MP_3 - MP_4 fork. Legs proportionately long, slender, femur and tibia subequal in length; tarsus with segment 1 long, $\geq 2X$ length of segment 2, segments 2-4 or 3-4 with densely setose membranous pads ventrally, segment 4 with setose pad extended anteroapically and briefly divided; pretarsal claw simple, asetose. Male with abdominal ventrite 5 broadly rounded or subtruncately lobed. Female with abdominal ventrite 5 broadly, shallowly emarginate, with or without a median subtruncate lobe. Aedeagus with lateral lobe hooked apically, and with a single or only a few apical setae. Gonocoxites slender, lightly sclerotized; styli elongate; bursa copulatrix trisaccate with a heavily sclerotized and spinose collar.

Dioxypterus eua Johnson, NEW SPECIES

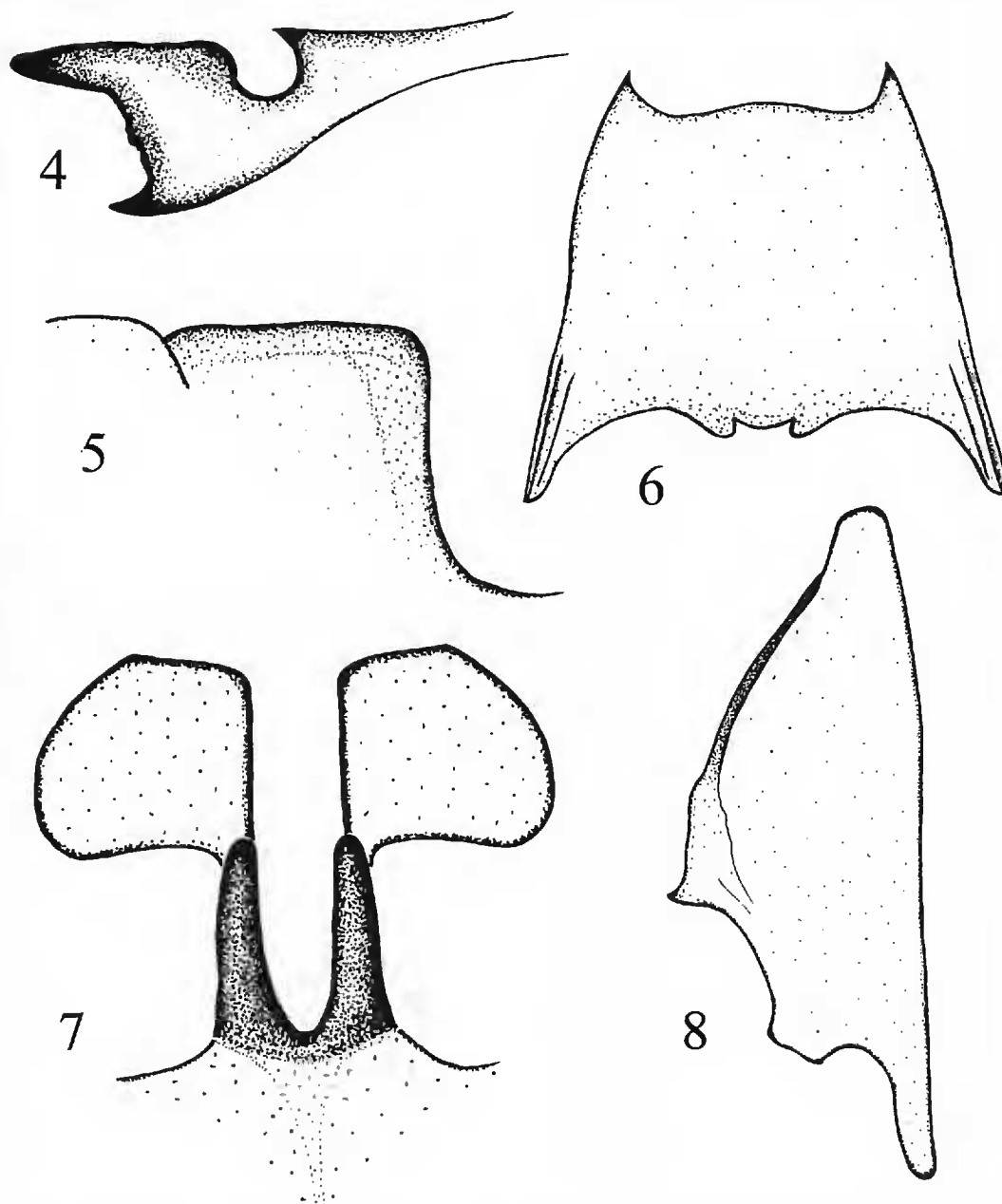
(Figs. 1, 8-9, 11-13, 15, 17, 19, 21)

Types.—Holotype, male; data: TONGA. *EUA I.*: Hafu, 100-200 m, Feb 1972, N.L.H. Krauss; deposited: Bernice P. Bishop Museum, Honolulu. Paratypes: Hafu, 150-200 m, Feb 1969, N.L.H. Krauss, 1 female; Pangai, 0-100 m, Jan 1979, N.L.H. Krauss, 1 male; hills above Pangai, 100-300 m, Jan 1979, N.L.H. Krauss, 1 male; Parker's Hill area, 200-300 m, Mar 1969, N.L.H. Krauss, 1 female; Ohonua, Feb 1956, N.L.H. Krauss, 1 female. Paratypes deposited: Bernice P. Bishop Museum, Honolulu.

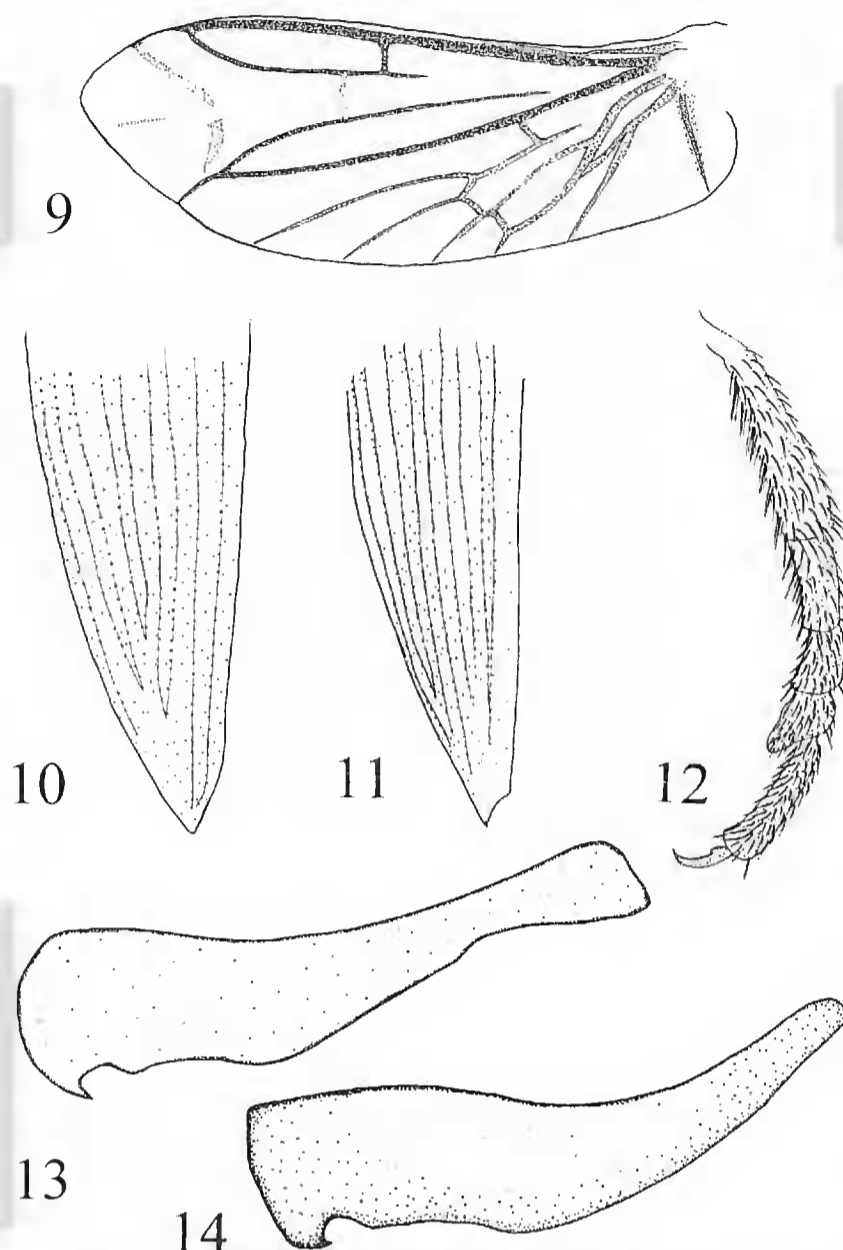
Description.—Length 9.1-11.6 mm, width 2.8-3.4 mm; body flavotestaceous, with castaneous highlights, the following structures and patterns piceous: a pair of bifurcate vittae on frons and median spot on frontal margin, anterolateral portions and hind angles of pronotum, anterior third of hypomeron, prosternum, elevated rim of mesosternal fossa, mediolateral portions of metasternum, medial margin of metacoxa, sutural margins of ventral sclerites, and humeral region and stria punctures of elytra. Antennae and legs brunneous. Pubescence aurantaceous, moderately-dense, forming a pair of whorls on pronotal disc. Head evenly, moderately-sparsely, finely punctured; ocular index = 66; supra-antennal ridges subcarinate, shallowly arcuate over antennal fossa, then transverse, evanescently conjoined medially; clypeal region obsolescent, coarsely punctured. Antenna (Fig. 1) short, reaching to apex of pronotal hind angle; segment 2 short, segment 3 subcylindrical; segments 4-10 short, serrate; segment 2-11 length ratio = 1.0:1.2:2.0:1.8:1.8:1.8:1.9:1.8:1.8:2.2. Labrum broadly rounded anteriorly, slightly transverse, coarsely punctured. Pronotum with medial length 0.83X width across hind angles at posterior margin, moderately-sparsely and finely punctured on disc, becoming denser and coarser anterolaterally; lateral margin carinate, remaining distinct to anterior margin; hind angles nar-



Figures 1-3. *Dioxypterus* species, antenna. Figure 1. *D. eua*. Figure 2. *D. tonga*. Figure 3. *D. beaveri*.



Figures 4-8. *Dioxypterus* species. Figure 4. *D. beaveri*, prosternal process, lateral aspect; Figure 5. *D. tonga*, mesosternal profile, posterior portion. Figure 6. *D. tonga*, pronotum. Figure 7. *D. tonga*, mesosternum, ventral aspect. Figure 8. *D. eua*, left hypomeron.



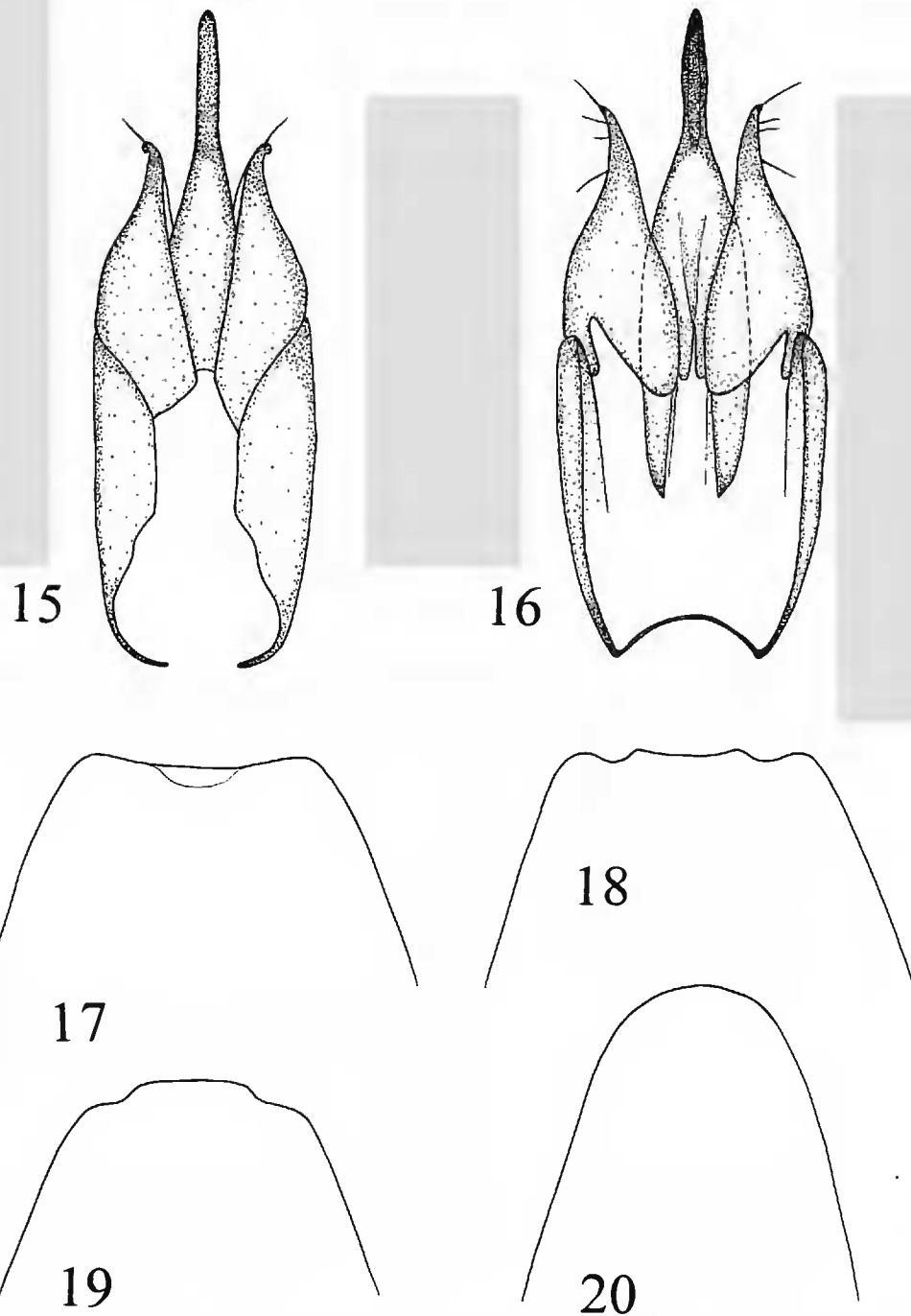
Figures 9–14. *Dioxypterus* species. Figure 9. *D. eua*, metathoracic wing. Figure 10. *D. tonga*, elytral apex. Figure 11. *D. eua*, elytral apex. Figure 12. *D. eua*, metatarsus. Figure 13. *D. eua*, metacoxal lamina. Figure 14. *D. tonga*, metacoxal lamina.

rowly rounded at apex, dorsal carinae subequal in length, anterior ends terminating abruptly. Hypomeron (Fig. 8) moderately-sparsely, shallowly punctured; mesal margin with narrow, flattened, polished, sparsely punctured head widening posteriorly; posterior margin with median, subquadrate lobe. Prosternum with punctures fine, shallow; anterior lobe broadly arcuate; intercoxal process arcuate, compressed, acute at apex, expanded dorsally and subvertical posteriorly. Mesosternum with sides of median fossa slightly elevated, subvertically declivous; fossa narrowly U-shaped in ventral aspect; mesepisternum narrowly rounded at mesocoxal cavity. Elytral apex (Fig. 11) acute, shallowly arcuate mesally. Metathoracic wing (Fig. 9) with radial cell large; RP_1 , RP_2 , and RP_3 not conjoined, RP_2 obsolescent. Metasternum finely, shallowly, moderately-densely punctured; connate with mesosternum, sutural trace absent; midline shallowly engraved throughout; coxal lamina (Fig. 13) shallowly sinuate posteriorly; tarsus (Fig. 12) with segment length ratio = 1.0:0.4:0.3:0.2:0.5, segment 4 obliquely extended ventroapically.

Male.—Abdominal ventrite 5 (Fig. 19) with median subrectangular lobe at apex. Aedeagus (Fig. 15) with median lobe subparallel apically, apex obtuse; lateral lobe strongly narrowing at midlength, narrow and hooked at apex, with single seta at apex.

Female.—Abdominal ventrite 5 (Fig. 17) emarginate and shallowly impressed at apex. Bursa copulatrix as in Fig. 21.

Diagnosis.—This species is similar in size and coloration to *D. ovalauensis* Van Zwaluwenburg, from Fiji. These two can be separated by color pattern, distribution, and genital morphology, as given in the key, below.



Figures 15–20. *Dioxypterus* species. Figure 15. Aedeagus of *D. eua*, dorsal aspect. Figure 16. Aedeagus of *D. tonga*, dorsal aspect. Figure 17. *D. eua*, female ventrite 5, outline of apex. Figure 18. *D. beaveri*, female ventrite 5, outline of apex. Figure 19. *D. eua*, male ventrite 5, outline of apex. Figure 20. *D. tonga*, male ventrite 5, outline of apex.

Etymology.—Named after the island of provenance, Eua, and treated as a noun in apposition.

Distribution.—Known only from Eua Island.

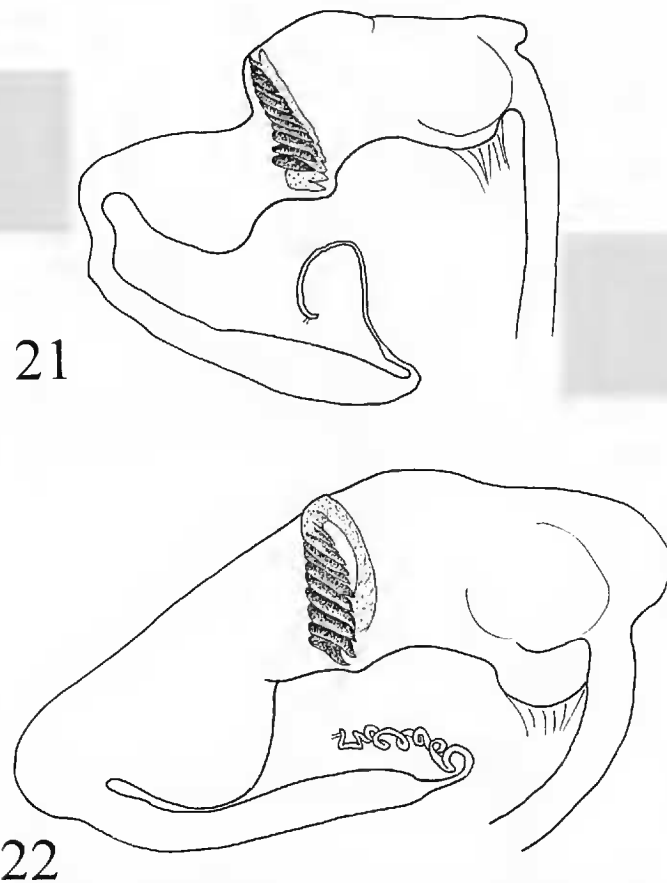
Material Examined.—See Types.

Dioxypterus tonga Johnson, NEW SPECIES

(Figs. 2, 5–7, 14, 16, 20)

Type.—Holotype, male; data: TONGA. *EUA I*, Hafu, 100–200 m, Feb 1972, N.L.H. Krauss; deposited: Bernice P. Bishop Museum, Honolulu.

Description.—Length 18.2 mm, width 5.9 mm; Body brunneotestaceous, with infusate highlights; frons with a pair of narrow infusate maculae between eyes, pronotum with large infusate lateral maculae extending along margins and hind angles and narrowly conjoined along anterior margin, midline and posterior third brunneotestaceous; scutellum brunneotestaceous; elytra brunneotestaceous, except narrowly infusate striae. Pubescence aurantaceous, moderately-dense, directed posteriorly ex-



Figures 21–22. *Dioxypterus* species, bursa copulatrix and accessory gland duct. Figure 21. *D. eua*. Figure 22. *D. beaveri*.

cept as follows: directed anteriorly on head, pronotum with two discal whirls and setae directed anteriorly on anterior half and laterally on sides. Head evenly, moderately-sparsely, finely punctured; ocular index = 59; frontal margin obtuse, not cariniform, supra-antennal portion shallowly arcuate over each antennal fossa, median portion transverse; clypeal region obsolescent, coarsely punctured. Antenna (Fig. 2) short, reaching apex of pronotal hind angle; segment 2 short, segment 3 subcylindrical, segments 4–10 serrate; segments 2–11 length ratio = 1.0:1.8:2.5:2.4:2.4:2.0:2.0:2.0:2.0:2.9. Labrum broadly rounded anteriorly, slightly transverse, finely punctured. Pronotum (Fig. 6) with medial length 0.76X width across hind angles at posterior margin, moderately-sparsely and finely punctured on disc, denser and coarser anterolaterally; lateral margin carinate, evanescent anteriorly; hind angles narrowly rounded at apex, lateral dorsal carina 1.8X length of mesal carina, anterior ends of carinae obsolescent. Hypomerion coarsely, umbilicately punctured; mesal margin with moderately broad, flattened, polished, sparsely punctured anteriorly; posterior margin with median, subquadrate lobe. Prosternum with punctures shallowly umbilicate; anterior lobe broadly, shallowly arcuate; intercoxal process shallowly arcuate, compressed, obtuse at apex, expanded dorsally and broadly concave posteriorly. Mesosternum (Figs. 5, 7) with sides of median fossa strongly elevated, subvertically declivous; fossa narrowly V-shaped in ventral aspect; mesepisternum truncate at mesocoxal cavity. Elytral apex evenly attenuate, oblique mesally. Metathoracic wing similar to preceding species. Metasternum finely, shallowly, moderately-densely punctured; connate with mesosternum with partial sutural trace present laterally; midline shallowly engraved throughout; coxal lamina (Fig. 14) arcuate posteriorly; tarsus with segment 4 extended ventroapically, segment length ratio = 1.0:0.6:0.4:0.3:0.8.

Male.—Abdominal ventrite 5 evenly rounded apically (Fig. 20). Aedeagus (Fig. 16) with median lobe narrow, attenuate at apex; lateral lobes strongly narrowing, arcuate laterally, and with 4 subapical setae.

Female.—Unknown.

Diagnosis.—This specimen is distinct from all known species of *Dioxypterus* in the combination of its size, coloration, pubescence, aedeagal morphology, and distribution. Only *D. gressitti* Van Zwaluwenburg is similar in size and general coloration, but differs considerably in most other traits and is only known from Guadalcanal, Solomon Islands. *Dioxypterus tonga* lacks immediate known affin-

ities and possesses certain characteristics which are tentatively regarded as ancestral in expression, such as the ecarinate frontal margin, integument and pubescence lacking discrete patterns and contrasting coloration, meso-metasternal suture with surface trace restricted to lateral portions, and male abdominal ventrite 5 evenly rounded at apex.

Etymology.—Named after the country of origin, Tonga, and is treated as a noun in apposition.

Distribution.—Known only from Eua Island.

Material Examined.—See Type.

Dioxypterus beaveri Johnson, NEW SPECIES

(Figs. 3–4, 11, 18, 22)

Type.—Holotype, female; data: FIJI. *VITI LEVU*, Savura Creek, 1–7 Sep 1981, malaise trap, luminous, 39 09, R.A. Beaver; deposited: Bernice P. Bishop Museum, Honolulu.

Description.—Length 11.0 mm, width 3.1 mm; integument of head and antennal segments 4–11 piceous, and pronotum, elytra and most of venter brunneopiceous, with antennal segments 1–3, labrum, anterior lobe of prosternum, hypomeron, mesosternum, mesepisternum, epipleuron, and medio-basal portion of elytra testaceous, legs infusate. Sculpture of small, simple, moderately-dense punctures, sparse on hypomeron. Pubescence long, directed laterally from median line on pronotum, otherwise longitudinally arranged; color is generally pale testaceous, but matches ground color to form a transverse, midlength elytral fascia and apico-lateral inverted "L" pattern. Head with supra-antennal ridges obtuse, shallowly arched, obsolete medially; frontal margin coarsely punctate medially; clypeal region narrow, coplanar with frons, not separated by ridge or carina medially; ocular index = 62. Antenna (Fig. 3) short, reaching posterior margin of pronotum; segment 2 subquadrate, segment 3 subcylindrical, segments 4–10 serrate; segments 2–11 length ratio = 1.0:1.4:2.1:1.9:1.9:1.9:1.9:1.9:1.9:2.4. Labrum broadly rounded anteriorly. Pronotum with medial length 0.84X width across hind angles at posterior margin, moderately-sparsely and finely punctured on disc, becoming denser and coarser laterally; lateral margin carinate; hind angles narrowly rounded at apex, lateral dorsal carina 1.4X length of mesal carina, strongly elevated and slightly reflexed laterally. Hypomeron sparsely set with shallow and small to moderate sized punctures; mesal margin with moderately broad, flattened and polished, slightly elevated bead and a narrow sulcus adjacent to bead; posterior margin with median, subquadrate lobe. Prosternum punctured as hypomeron; anterior lobe broadly, evenly arcuate; intercoxal process (Fig. 4) strongly arcuate, compressed, acute at apex, expanded dorsally and subvertical posteriorly. Mesosternum with sides of median fossa strongly elevated, subvertically declivous; fossa narrowly V-shaped in ventral aspect; mesepisternum narrowly adjacent to mesocoxal cavity. Elytral apex similar to Fig. 11. Metathoracic wing similar to that of preceding species. Metasternum finely and sparsely punctured; connate with mesosternum, without trace of suture; midline shallowly engraved throughout; coxal lamina similar to Fig. 14, shallowly sinuate posteriorly; tarsus with segment 4 extended ventroapically, segment length ratio = 1.0:0.4:0.3: 0.2:0.5.

Female.—Abdominal ventrite 5 (Fig. 18) with transverse, rectangular, median projection at apex. Bursa copulatrix as in Fig. 22.

Male.—Unknown.

Diagnosis.—This species differs from other described Fijian *Dioxypterus* by its relatively small size, dark dorsal integument, and the rectangular apical projection on ventrite 5 of the female. This species is most similar to *D. vagepictus* Fairmaire in general coloration and patterns of pubescence on the elytra, but is readily distinguished by the dark and unicolorous pronotum of *D. beaveri*, versus a testaceous pronotum with 2 longitudinal piceous vittae on the disc of *D. vagepictus*.

Etymology.—Named in honor of Roger A. Beaver, Chiang Mai, Thailand, in

gratitude for collecting this interesting specimen and his contributions to coleopterology.

Material Examined.—See Type.

Dioxypterus ovalauensis Van Zwaluwenburg

Dioxypterus ovalauensis was originally described (Van Zwaluwenburg 1933) from Ovalau, Fiji. There are no subsequent island records published for this species. Specimens were examined from two localities on Viti Levu and these represent a new island record for this species.

Material Examined.—FIJI VITI LEVU: Navai, 700–800 m, 29 Sep 1970, N.L.H. Krause, 1 male (deposited BPBM); Colo-i-suva, 3–6 Mar 1963, C.M. Yoshimoto, 1 female (deposited BPBM); Savura Creek, 3–9 Apr 83, malaise trap, 58 40, R.A. Beaver; 1 female (deposited PJJC).

KEY TO THE SPECIES OF *DIOXYPTERUS* FROM TONGA AND FIJI

- | | | |
|----------|--|------------------------------------|
| 1a. | Small, ≤ 15.0 mm in length; elytra bicolored, with maculae and bands | 2 |
| 1b. | Size large, ca. 18.0 mm in length; elytra bruneotestaceous; pubescence golden; Tonga: Eua I | <i>tonga</i> NEW SPECIES |
| 2a (1a). | Body flavous to orange; tarsi, pronotal hind angles, elytral maculae piceous to black | 3 |
| 2b. | Body testaceous, brunneous or brunneopiceous; elytra with flavous or brunneous maculae or bands | 7 |
| 3a (2a). | Pronotal disc unicolorous, hind angles piceous; elytral ground color same as on venter and pronotum | 4 |
| 3b. | Pronotum flavous, disc with pair of longitudinal infuscate vittae; elytral ground color flavobrunneous, with 3 oblique infuscate bands; Fiji: Viti Levu | <i>vagepictus</i> Fairmaire |
| 4a (3a). | Elytral basal half concolorous with pronotum, piceous to black in apical half, apical quarter with triangular patch of testaceous pubescence | 5 |
| 4b. | Elytra orange in basal half, brunneous in apical third with testaceous pubescence, a transverse black band at midlength, and an oblique black band from humerus to suture and along suture to transverse band; Fiji: Viti Levu | <i>nigrotransversus</i> Fairmaire |
| 5a (4a). | Elytra lacking transverse band and postscutellar patch, anterior margin of apical black area emarginate | 6 |
| 5b. | Elytra with angulate transverse band at apical third; postscutellar area infuscate; Fiji: Viti Levu | <i>muii</i> Van Zwaluwenburg |
| 6a (5a). | Elytra with anterior margin of apical black area semicircularly emarginate; integument with apical triangular area piceous; Fiji: Taveuni | <i>taveuni</i> Van Zwaluwenburg |
| 6b. | Elytra with anterior margin of apical black area cordately emarginate; integument with apical triangular area rufous; Fiji: Wakai | <i>wakayensis</i> Van Zwaluwenburg |
| 7a (2b). | Elytra with base flavous between humerus and scutellum, and with angulate transverse, brunneous bands at midlength and apical third | 8 |

- 7b. Elytra concolorous, with an oblique series of spots of pallid pubescence at midlength and a transverse band of pallid setae at apical third 10
- 8a (7a). Elytral intervals flat, midlength macula forming a band reaching suture; pronotum infusate, hind angles piceous; Fiji: Viti Levu 9
- 8b. Elytral intervals shallowly convex, midlength macula reaching medially to interval 5 or 6; pronotum pale with infusate maculae on disc, hind angles pale; Tonga: Eua *eua* NEW SPECIES
- 9a (8a). Length 11.0 mm; pronotum dark infusate to piceous on disc; elytra with piceous integumental color beneath pubescence of anterior band and apical third *beaveri* NEW SPECIES
- 9b. Length 12.9–14.2 mm; pronotum flavous with infusate highlights; elytra with brunneoflavous integument beneath pubescence of anterior band and apical third *flexuosus* Fairmaire
- 10a (7b). Larger, 13–14 mm in length; scutellum and elytral bases dark; elytra with anterolateral midlength spot circular and discrete from intervals 6 to 8; Fiji: Viti Levu *guttulatus* Fairmaire
- 10b. Smaller, 10–12 mm in length; anterior one-half of scutellum and base of elytral interval 3 flavous; elytra with anterolateral midlength spot transverse from interval 6 and reaching costal margin; Fiji: Ovalau, Viti Levu *ovalauensis* Van Zwaluwenburg

DISCUSSION

Candèze (1891) assigned *Dioxypterus* to his broadly inclusive "Ludiites." Schwarz (1902) placed the genus in his "Chalcolepidiites" (= Hemirhipini), based on the fusion of the meso- and metasterna and lack of a sutural trace between the mesocoxae. On this same character, Van Zwaluwenburg (1959) arranged the genus in Campsosterninae, the latter a synonym of Oxynopterini. However, the relative degree of fusion and disappearance of surface traces of the meso-metasternal suture is highly variable within many elaterid lineages (e.g., Laurent 1961, Casari-Chen 1985), and is undoubtedly convergently derived.

In general, relationship extrapolation and suprageneric taxonomic assignment of taxa within the family is most reliably based on larval structure (e.g., Hyslop 1917, Ôhira 1962, Dolin 1978, Calder et al. 1993). Unfortunately, larvae attributable to any *Dioxypterus* species remain unknown. Based on salient adult traits given in the generic redescription above and notably the lack of setae on the tarsal claws, morphology of mesonotal sclerites (Gurjeva, 1974), and wing venation (Dolin, 1976), *Dioxypterus* properly belongs in Elaterinae. A further assignment to Dicrepidiini is based on the head capsule having a convex frons, the frontal carina conjoint with the supra-antennal carinae, closed pronotosternal sutures, and the tarsi with ventral setal pads and an ventroapical extension of segment 4. Assignment to Elaterinae, Dicrepidiini, is a new classificatory arrangement.

Described species of *Dioxypterus* can be placed in two taxonomic groups based on coloration patterns and generally on indigenous distribution. The first group, Group I, including the new Tongan species, contains those species that are cryptically colored of dingy browns and yellows, often forming bands and maculae.

Structurally, these species possess an incomplete frontal carina, the meso-metasternal suture is incompletely connate and there remains a traceable intercoxal suture line or groove. These species have a more southerly distribution and are found throughout Fiji, Tonga and Vanuatu, generally being endemic to either a single island or a local archipelago. Species of this group are known from the Solomon Islands, but only on Guadalcanal.

The second species group, Group II, exhibits contrasting bright red to orange on black patterns that may be aposematic coloration. In contrast to the species in Group I these tend to possess derived characteristics such as a complete frontal carina, and connate meso-metasterna with the intercoxal suture absent and usually untraceable at the surface. Most of these species are each found on one or more islands throughout the Solomon and Bismarck archipelagos, and northeastern-most Papua New Guinea, but there is one species in each of Fiji and Vanuatu.

In general, the diagnostic traits of the first species group are relatively ancestral in their expression, while those of the second species group are relatively derived. The pattern of generalized relationship and distribution is noted here because of its additive importance with that of other taxa noted below to Fijian regional biogeography. The species of Group I indicate that ancestral character states are found in those species endemic to the Fijian Region. This region contains an unusually high concentration of isolated taxa and ancestral characteristics within Elateridae. Further, the few Group II taxa in Fiji and their absence from Tonga suggest some degree of parapatric speciation between the two species groups.

The biotic similarity of Tonga with Fiji and the shared geological history (Ewart, 1988) of both archipelagos made the discovery of *Dioxypterus* species from Tonga predictable. Previous insect faunal conclusions of a largely Fiji-derived biota in Tonga were made for cicadas (Duffels 1988), barklice (Thornton 1981a-b), and butterflies (Miller & Miller 1993). Similarly, Tonga shares with Fiji and Vanuatu a number of click beetle genera, such as *Dioxypterus*, that are either endemic (*Photophorus* Candèze, *Hifo* Candèze, *Conobajulus* Van Zwaluwenburg) to the Fijian region, or have numerous species endemic to the region with species pairs shared between islands and archipelagoes (i.e. *Simodactylus* Candèze, *Pacificola* Van Zwaluwenburg, *Tetrigus* Candèze). The species of this latter set of taxa express character states that are ancestral in the Fijian region, relative to congenics elsewhere in the South Pacific region. As noted above, the species of *Dioxypterus* follow this latter pattern with those species expressing the most intragenerically derived character states found in the Solomon Islands and Papua New Guinea. Overall, the distributions of *Dioxypterus* species and other endemic taxa correspond quite well with proposed phytogeographic segregation of the Fijian region (e.g., Takhtajan, 1986) and generalized Outer Melanesian Island Arc distributions (e.g., Holloway 1984, Polhemus 1995).

Though there is not a phylogenetically established sister genus for *Dioxypterus*, potential candidates are *Symphostethus* Schwarz (7 species in the Solomon Is. and Papua New Guinea) and the monobasic and neotropical *Ypsilosthetus* Candèze. All three genera share traits involving unique prosternal and mesosternal morphology, with *Dioxypterus* and *Ypsilosthetus* being more similar in elytral structure and pubescence style. A potential sister group for these three genera remains unresolved.

This latter genus pairing is similar to four other South Pacific/neotropical ge-

neric pairs of click beetles: the Tongan *Hifo* Candèze with the Brazilian *Cryptolamprus* Costa (Costa 1984), *Photophorus* Candèze from Fiji and Vanuatu with Meso-American *Ignelater* Costa (Costa 1975), the Fijian *Propsephus* Candèze with neotropical *Dipropus* Eschscholtz and the Fijian *Conobajulus* Van Zwaluwenburg with the neotropical *Chalcolepis* Candèze. The *Hifo*/*Cryptolamprus* and *Photophorus*/*Ignelater* associations are particularly intriguing as the Fijian Region species of *Hifo* and *Photophorus* are the only bioluminescent elaterids known outside of the neotropics. With Indomalasian and Australian affinities lacking for any of the Fijian endemic genera, their unusual apparent neotropical phylogenetic associations demand further attention as they suggest that these biogeographically uniques are most likely Gondwanian faunal relics.

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